

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA
(University of Technology of Madhya Pradesh)

Air Port Bypass Road
Gandhi Nagar, Bhopal-462 036

COURSE OF STUDY AND SCHEME OF EXAMINATION
MASTER OF COMPUTER APPLICATIONS (MCA)

W.E.F. 2005-2006

MCA FIRST SEMESTER

Course No.	Course Name	L (Hrs)	T (Hrs)	P (Hrs)	Theory Marks		Sessional Marks		Practical Marks		Total Marks
					Max	Min	Max	Min	Max	Min	
MCA-101	Information Technology	3	1	-	100	40	50	30	-	-	150
MCA-102	Mathematical Foundation of Computer Science	3	1	-	100	40	50	30	-	-	150
MCA-103	Programming and Problem Solving in C	3	1	-	100	40	50	30	-	-	150
MCA-104	Computer organization and Assembly Language Programming	3	1	4	100	40	50	30	50	25	200
MCA-105	Communication Skills	3	1	-	100	40	50	30	-	-	150
MCA-106	Programming Laboratory in C	-	-	6	-	-	100	60	100	50	200
	Total	15	5	10	500		350		150		1000

MCA-101

Information Technology

UNIT-I

Basic concepts of IT, concepts of Data & Info, data processing, history of computers (generation, type of languages), organization of computers, I/O devices, storage devices, system software, application software, utility packages, numerical based on storage devices.

UNIT-II

Assembler : Elements of assembly language programming, a simple assembly scheme, pass structure of assembler, design of two pass assemblers, a single pass assemblers.

Macros & Macro Processors : Macro definition & Call, Macro expansion Nested macro calls, advanced macro facilities, design of macro processors.

UNIT-III

Compilers & Interpreters : aspects of compilation, memory allocation, compilation of expression compilation of control structures, code optimization, interpreters.

Software Tools : Software tools for program development, editors, debug monitors, programming environment, user interfaces.

UNIT-IV

Linker & Loaders : Relocation & linking concepts, design of linkers, self relocating programs, a linker for MS DOS, linking for overlays, loaders : A two pass loader scheme, Relocating loaders, subroutine linkage, Direct linkage loader, Binders overlays.

UNIT-V

Sequential file organisation, random file organisation, index structure, indexed file organisation, alternate key indexed sequential files, multi key organisation, multi key access, multi list file organisation, inverted files & their definitions, insertion, deletion, operations with optimum utilization of memory, comparison of various type of file organisation.

BOOKS

1. D.M. Dhamdhere “ System Programming & O.S.” 2nd Ed., Tata Mc. Graw Hill.
2. J. Donovan “System Programming” THM.
3. Rajaraman V. “Fundamental of Computers” (4nd edition.) Prentice Hall of India, New Delhi 2004.
4. Sardes D.H. “Computer’s today” McGraw Hill 1988.
5. S.Jaiswal, “Fundamental of Computer & IT”, Wiley dreamtech India..

Note : Paper is to be set unit wise with internal choice.

MCA-102

Mathematical Foundation of Computer Science

UNIT-I

Sets, Relations and Functions:

Sets, Subsets, Power sets, Complement, Union and Intersection, Demorgan’s law Cartesian products, Relations, relational matrices, properties of relations, equivalence relation, functions ,Injection, Surjection and Bijective mapping, Composition of functions, the characteristic functions and Mathematical induction.

UNIT-II

Proportions & Lattices :

Proposition & prepositional functions, Logical connections Truth-values and Truth Table, the algebra of propositional functions-the algebra of truth values-Applications (switching circuits, Basic Computer Components).

Partial order set, Hasse diagrams, upper bounds, lower bounds, Maximal and minimal element, first and last element, Lattices, sub lattices, Isotonicity , distributive inequality, Lattice homomorphism, lattice isomorphism ,complete lattice ,complemented lattice distribution lattice .

UNIT-III

Groups and Fields:

Group axioms ,permutation group, sub group, co-sets, normal subgroup, semi group, Lagrange theorem, fields, minimal polynomials, reducible polynomials, primitive polynomial, polynomial roots, applications.

UNIT-IV

Graphs:

Finite graphs, incidence and degree, isomorphism, sub graphs and union of graphs, connectedness, walk, paths, and circuits Eulerian graphs ,tree properties of trees, pendant vertices in tree, center of tree ,spanning trees and cut vertices, binary tree ,matrix representation of graph, incidence and adjacency matrix and their properties, applications of graphs in computer science.

UNIT-V

Discrete Numeric function and Recurrence relation:

Introduction to discrete numeric functions and generating functions introduction to recurrence relations and recursive algorithms, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions and total solutions

BOOKS

1. J.P.Trembley & R.P.Manohar “Discrete Mathematical Structure with applications to Computer Science”.
2. Kenneth H. Rosen-203 “Discrete Math & its Applications” 5th ed.
3. K.A. Ross and C.R.B. Wriht “Discrete Mathematics “.
4. Bernard Kolman & Robert C. Busby “Discrete Mathematical Structures for Computer Science”.

Note : Paper is to be set unit wise with internal choice.

MCA-103

Programming and Problem Solving in C

UNIT-I

An overview: Problem identification, analysis, design, coding, testing & debugging, implementation, modification & maintenance; algorithms & flowcharts; Characteristics of a good program - accuracy, simplicity, robustness, portability, minimum resource & time requirement, modularization; Rules/conventions of coding, documentation, naming variables; Top down design; Bottom-up design.

UNIT-II

Fundamentals of C Programming: History of C; Structure of a C Program; Data types; Constant & Variable, naming variables; Operators & expressions; Control Constructs – if-else, for, while, do-while; Case switch statement; Arrays; Formatted & unformatted I/O; Type modifiers & storage classes; Ternary operator; Type conversion & type casting; Priority & associativity of operators.

UNIT-III

Modular Programming: Functions; Arguments; Return value; Parameter passing – call by value, call by reference; Return statement; Scope, visibility and life-time rules for various types of variable, static variable; Calling a function; Recursion – basics, comparison with iteration, types of recursion- direct, indirect, tree and tail recursion, when to avoid recursion, examples.

UNIT-IV

Advanced Programming Techniques: Special constructs – Break, continue, exit(), goto & labels; Pointers - & and * operators, pointer expression, pointer arithmetic, dynamic memory management functions like malloc(), calloc(), free(); String; Pointer v/s array; Pointer to pointer; Array of pointer & its limitation; Function returning pointers; Pointer to function, Function as parameter; Structure – basic, declaration, membership operator, pointer to structure, referential operator, self referential structures, structure within structure, array in structure, array of structures; Union – basic, declaration; Enumerated data type; Typedef; command line arguments.

UNIT-V

Miscellaneous Features: File handling and related functions; printf & scanf family;C preprocessor – basics, #Include, #define, #undef, conditional compilation directive like #if, #else, #elif, #endif, #ifdef and #ifndef; Variable argument list functions.

BOOKS:

1. Kerninghan & Ritchie “The C programming language”, PHI
2. Schildt “C:The Complete reference” 4th ed TMH.
3. Cooper Mullish “The Spirit of C”, Jaico Publishing House, Delhi
4. Kanetkar Y. “Let us C”, BPB.
5. Kanetkar Y.: “Pointers in C”, BPB
6. Gottfried : “Problem Solving in C”, Schaum Series
7. Jones, Harrow Brooklish “C Programming with Problem Solving”, Wiley Dreamtech India.

Note : Paper is to be set unit wise with internal choice.

MCA-104

Computer organization and Assembly Language Programming

UNIT-I

Representation of Information: Number systems, integer and floating-point representation, character codes (ASCII, EBCDIC), Error detection and correction codes : parity check code, cyclic redundancy code, Hamming code . Basic Building Blocks: Boolean Algebra, Simplification of Boolean Function. Combinational blocks: gates, multiplexers, decoders, Implementation of Boolean Function in form of gates etc. Sequential building blocks: flip-flops, Registers : Buffer register, Right & Left Shift register, Bidirectional Shift register. Counters : Ripple counter, Binary Counter, MOD-10 Counter, Ring Counter. ALU, Random access memory etc.

UNIT-II

Register Transfer Language and Micro-operations: concept of bus, data movement among registers, a language to represent conditional data transfer, data movement from/to memory. Design of simple Arithmetic & Logic Unit & Control Unit, arithmetic and logical operations Along with register transfer, timing in register transfer.

UNIT-III

Architecture of a simple processor: A simple computer organization and instruction set, instruction formats, addressing modes, instruction cycle, instruction execution in terms of microinstructions, interrupt cycle , concepts of interrupt and simple I/O organization, Synchronous & Asynchronous data transfer, Data Transfer Mode : Program Controlled, Interrupt driven, DMA (Direct Memory Access). implementation of processor using the building blocks.

UNIT-IV

Assembly Language programming: Pin Diagram of 8086, Architecture of 8086, Addressing Mode of 8086, detailed study of 8086/8088 assembly language, instruction set of 8086, loops and Comparisons, conditions and procedures, arithmetic operations in assembly language. Simple Assembly Language program of 8086. illustrations using typical programs like: table search, subroutines, symbolic and numerical manipulations and I/O.

UNIT-V

Memory organization: Secondary Memory, Primary Memory : Random access memory, Read Only memory basic cell of static and dynamic RAM, Building large memories using chips, Concept of segmentation & Paging, Associative memory, cache memory organization, virtual memory organization.

BOOKS

1. M. Morris Mano, "Computer System Architecture", PHI, 3rd edition, 1993
2. Govindarajulu "Computer Architecture & Organisation".
3. Liu and Gibson, "8086/8088 Micro processor Assembly Language".
4. M. Mano "Digital Logic & Computer Design"
5. Malvino, "Digital Computer Electronics".

Note : Paper is to be set unit wise with internal choice.

MCA-105
Communication Skills

UNIT-I

Communication

Meaning and process of communication, importance of effective communication, communication situation, barriers to communication. Objectives of communication, types of communication, principles of communication, essentials of effective communication.

UNIT-II

Media of Communication

Written, oral, face-to-face, visual, audio-Visual, merits and demerits of written and oral communication.

UNIT-III

Communication Skills:

Developing communication skills; Listening; Speaking; Reading-Writing (Oral & Written). Body language; Utility of aids in Communication.

UNIT-IV

Spoken Skills

Preparing for oral presentation, conducting presentations; Debates; Seminar; Speeches; Lectures; Interviews; Telephonic Conversation; Negotiations; Group Discussions.

UNIT-V

Written Skills:

Preparing of bio-data, seminar, paper, bibliography, and official correspondence; Mechanics of writing; Formal & Informal writings, letters; paragraphing, precise, report writing, technical reports, length of written reports, organizing reports, writing technical reports; Creative writing; Common Errors in Language.

BOOKS:

1. Rajendra Pal and J.S. Korlahalli "Essentials of Business Communication" , Sultan Chand & Sons Publishers, New Delhi.
2. U.S.Rai & S.M. Rai "Business Communications" , Himalaya Publishing House.
3. Menzal and D.H. Jones "Writing a technical Paper", Mc Graw Hill, 1961.
4. Strategy and Skill "Business Communication", Prentice Hall New Jersey, 1987
5. Scot Ober "Contemporary Business Communication", Wiley India.

Note : Paper is to be set unit wise with internal choice.

MCA SECOND SEMESTER

Course No.	Course Name	L (Hrs)	T (Hrs)	P (Hrs)	Theory Marks		Sessional Marks		Practical Marks		Total Marks
					Max	Min	Max	Min	Max	Min	
MCA-201	Operating System	3	1	-	100	40	50	30	-	-	150
MCA-202	Data Base Management System	3	1	-	100	40	50	30	-	-	150
MCA-203	Data Structure	3	1	4	100	40	50	30	50	25	200
MCA-204	Computer Oriented Numerical & Statistical Methods	3	1	-	100	40	50	30	-	-	150
MCA-205	Accounting & Management Control	3	1	-	100	40	50	30	-		150
MCA-206	Programming Laboratory in RDBMS	-	-	6	-	-	100	60	100	50	200
	Total	15	5	10	500		350		150		1000

MCA-201 **Operating System**

UNIT-I

Introduction: Evolution of operating systems (History of evolution of OS with the generations of computers), Types of operating systems, Multitasking, Timesharing, Multithreading, Multiprogramming and, Real time operating systems, Different views of the operating system, System Programmer's view, User's view, Operating system concepts and structure, Layered Operating Systems, Monolithic Systems.

Processes: The Process concept, The process control block, Systems programmer's view of processes, Operating system services for process management, Scheduling algorithms, First come first serve, Round Robin, Shortest run time next, Highest response ratio next, Multilevel Feedback Queues, Performance evaluation of scheduling algorithms stated above

UNIT-II

Memory Management : Memory management without swapping or paging, Concepts of swapping and paging, Page replacement algorithms namely, Least recently used, Optimal page replacement, Most recently used, Clock page replacement, First in First out (This includes discussion of Belady's anomaly and the category of Stack algorithms), Modeling paging algorithms, Design issues for paging system, Segmentation, Segmented Paging, Paged Segmentation

UNIT-III

Inter-process Communication and Synchronization: The need for inter-process synchronization, Concept of mutual exclusion, binary and counting semaphores, hardware support for mutual exclusion, queuing implementation of semaphores, Classical problems in concurrent programming, Dining Philosopher's problem, Bounded Buffer Problem, Sleeping Barber Problem, Readers and Writers problem, Critical section, critical region and conditional critical region, Monitors and messages.

Deadlocks: Concepts of deadlock detection, deadlock prevention, deadlock avoidance. Banker's Algorithm

UNIT-IV

File System: File systems, directories, file system implementation, security protection mechanisms.

Input/output: Principles of I/O Hardware: I/O devices, device controllers, direct memory access.

Principles of I/O software: Goals interrupt handlers, device drivers, and device independent I/O software. User space I/O Software.

Disks: Disk hardware, Disk scheduling algorithms (namely First come first serve, shortest seek time first, SCAN, C-SCAN, LOOK and C-LOOK algorithms) Error handling, track-at-a-time caching, RAM Disks.

Clocks: Clock hardware, memory-mapped terminals, I/O software.

UNIT-V

Processes and Processors in Distributed Systems: Threads, System models, processor allocation, scheduling. Distributed File Systems: Design, Implementation, and trends. Performance Measurement, monitoring and evaluation Introduction, important trends affecting performance issues, why performance monitoring and evaluation are needed, performance measures, evaluation techniques, bottlenecks and saturation, feedback loops.

Case Studies: WINDOWS and LINUX /UNIX Operating System.

BOOKS

1. Deitel, H.M. "An Introduction to Operating Systems". Addison Wesley Publishing Company 1984.
2. Milenkovic, M., "Operating Systems - concepts and Design" McGraw Hill International Edition-Computer Science series 1992.
3. Galvin P., J.L. Abraham Silberschatz. "Operating System Concepts". John Wiley & Sons Company, 1989.
4. Tanenbaum, A.S. "Modern Operating System", Prentice Hall of India Pvt. Ltd. 1995.
5. William Stallings "Operating Systems", Prentice Hall of India Pvt. Ltd.
6. Joshi R.C. "Operating System" Wiley India.

Note : Paper is to be set unit wise with internal choice.

MCA-202

Data Base Management System

UNIT-I

Introduction: Advantage of DBMS approach, various view of data, data independence, schema and sub-schema, primary concepts of data models, Database languages, transaction management, Database administrator and users, data dictionary, overall system architecture.

ER model: basic concepts, design issues, mapping constraint, keys, ER diagram, weak and strong entity sets, specialization and generalization, aggregation, inheritance, design of ER schema, reduction of ER schema to tables.

UNIT-II

Domains, Relations and Keys: domains, relations, kind of relations, relational database, various types of keys, candidate, primary, alternate and foreign keys.

Relational Algebra & SQL: The structure, relational algebra with extended operations, modifications of Database, idea of relational calculus, basic structure of SQL, set operations, aggregate functions, null values, nested sub queries, derived relations, views, modification of Database, join relations, DDL in SQL.

UNIT-III

Functional Dependencies and Normalization: basic definitions, trivial and non trivial dependencies, closure set of dependencies and of attributes, irreducible set of dependencies, introduction to normalization, non loss decomposition, FD diagram, first, second, third Normal forms, dependency preservation, BCNF, multivalued dependencies and fourth normal form, Join dependency and fifth normal form.

UNIT-IV

Database Integrity: general idea. Integrity rules, domain rules, attribute rules, relation rules, Database rules, assertions, triggers, integrity and SQL.

Transaction, concurrency and Recovery: basic concepts, ACID properties, Transaction states, implementation of atomicity and durability, concurrent executions, basic idea of serializability, basic idea of concurrency control, basic idea of deadlock, failure classification, storage structure types, stable storage implementation, data access, recovery and atomicity- log based recovery, deferred Database modification, immediate Database modification, checkpoints.

Distributed Database: basic idea, distributed data storage, data replication, data fragmentation-horizontal, vertical and mixed fragmentation.

UNIT-V

Emerging Fields in DBMS: object oriented Databases-basic idea and the model, object structure, object class, inheritance, multiple inheritance, object identity, data warehousing- terminology, definitions, characteristics, data mining and it's overview, Database on www, multimedia Databases-difference with conventional DBMS, issues, similarity based retrieval, continuous media data, multimedia data formats, video servers.

Storage structure and file organizations: overview of physical storage media, magnetic disks-performance and optimization, basic idea of RAID, file organization, organization of records in files, basic concepts of indexing, ordered indices, basic idea of B-tree and B+-tree organization

Network and hierarchical models: basic idea, data structure diagrams, DBTG model, implementations, tree structure diagram, implementation techniques, comparison of the three models.

BOOKS

1. A Silberschatz, H.F Korth, Sudersan "Database System Concepts" –, MGH Publication.
2. C.J Date "An introduction to Database Systems" –6th ed.
3. Elmasri & Navathe "Fundamentals of Database systems" – III ed.
4. B.C. Desai. "An introduction to Database systems" BPB
5. Raghurama Krishnan "Database Systems" TMH

Note : Paper is to be set unit wise with internal choice.

MCA-203

Data Structure

Prerequisites: Array, Structure, pointers, pointer to structure, functions, parameter passing, recursion.

UNIT-I

Stack and Queue: contiguous implementations of stack, various operations on stack, various polish notations-infix, prefix, postfix, conversion from one to another-using stack; evaluation of post and prefix expressions. Contiguous implementation of queue: Linear queue, its drawback; circular queue; various operations on queue; linked implementation of stack and queue- operations.

UNIT-II

General List: list and it's contiguous implementation, it's drawback; singly linked list-operations on it; doubly linked list-operations on it; circular linked list; linked list using arrays.

UNIT-III

Trees: definitions-height, depth, order, degree, parent and child relationship etc;

Binary Trees- various theorems, complete binary tree, almost complete binary tree;

Tree traversals-preorder, in order and post order traversals, their recursive and non recursive implementations; expression tree- evaluation; linked representation of binary tree-operations. Threaded binary trees; forests, conversion of forest into tree. Heap-definition.

UNIT-IV

Searching, Hashing and Sorting: requirements of a search algorithm; sequential search, binary search, indexed sequential search, interpolation search; hashing-basics, methods, collision, resolution of collision, chaining; Internal sorting- Bubble sort, selection sort, insertion sort, quick sort, merge sort on linked and contiguous list, shell sort, heap sort, tree sort.

UNIT-V

Graphs: related definitions: graph representations- adjacency matrix, adjacency lists, adjacency multilist; traversal schemes- depth first search, breadth first search; Minimum spanning tree; shortest path algorithm; kruskals & dijkstras algorithm.

Miscellaneous features Basic idea of AVL tree- definition, insertion & deletion operations; basic idea of B-tree- definition, order, degree, insertion & deletion operations;
B+-Tree- definitions, comparison with B-tree; basic idea of string processing.

BOOKS

1. Kruse R.L. Data Structures and Program Design in C; PHI
2. Aho "Data Structure & Algorithms".
3. Trembly "Introduction to Data Structure with Applications".
4. Tennenbaum A.M. & others: Data Structures using C & C++; PHI
5. Horowitz & Sahney: Fundamentals of Data Structures, Galgotia Publishers.
6. Yashwant Kanetkar, Understanding Pointers in C, BPB.

Note : Paper is to be set unit wise with internal choice.

MCA-204

Computer Oriented Numerical & Statistical Methods

UNIT – I

Numerical approximation, Representation of integers and real numbers in computers, fixed and floating point arithmetic, normalized floating point numbers, Round off and truncation errors, relative and absolute errors. Iterative methods: Zeros of single transcendental equations and zeros of polynomials using bisections, false position, Newton Raphson methods. Convergence of solutions.

Unit – II

Interpolation : Forward, Backward, central (Stirling's) and divided difference formulas, Lagrange's interpolation, Inverse interpolation for equal and unequal intervals.

Numerical Integration : Newton Cotes's formula, Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule. Gauss Legendre (two and three points) integration formula.

Unit – III

Simultaneous linear equations: Solutions of simultaneous linear equations – Gauss elimination method and pivoting, ill conditioned equations and refinement of solutions, Gauss-seidel iterative methods.

Solution of differential equation: Runge-Kutta fourth order method. Euler's method, Picard's, Taylor's series.

Unit - IV

Distributions : Binomial distribution, Poisson distribution and normal distribution, χ^2 distribution, Rectangular distribution, hypergeometric distribution.

Unit -V

Hypothesis testing for sampling: Small samples, t, z and f tests. Chi-square test.

Large samples : Comparison of large samples, testing the significance of the difference between the means of two large samples.

BOOKS

1. E. Balaguruswamy “Numerical Methods” , TMH, ISBN – 07-463311-2, 1999.
2. B.S. Grewal “Numerical Methods in Engineering & Science”.
3. Miller “Mathematical Statistics with applications” 7 ed, Pearson.
4. Gupta & Kapoor, Introduction to Statistics, Chand & Co.
5. V. Rajaraman “Computer Oriented Numerical Methods”.
6. M.Ray and Har Swarup Sharma “ Mathematical Statistics”.

REFERENCE BOOKS

1. Iyengyr M.K. Jain & R.K. Jain “Numerical Methods for scientific and engineering computation”, Wiley Eastern (New Age), 1995
2. E.V. Krishnamurthy & S.K. Sen “Computer Based Numerical Algorithms”.
3. Miller & Freund’s “Probability and Statistics for Engineers”.

Note : Paper is to be set unit wise with internal choice & emphasis is to be given on computerized implementation.

MCA-205

Accounting & Management Control

UNIT-I

Meaning and objects of accounting, accounting concepts and conventions, accounting equations, rules of Journalizing; Cash-book, Ledger posting, preparation of trial balance.

UNIT-II

Trading and profit and loss account and balance sheet with adjustments relating to closing stock , outstanding expenses, prepaid expenses , accrued income depreciation, bad debts, provision for bad debts, provision for discount on debtors and creditors .

UNIT-III

Inventory pricing , FIFO and LIFO methods; Simple problems of funds flow statement, cost volume, profit analysis.

UNIT-IV

Standard costing, computation of material and labour variances, budgetary control, preparation of cash budget and flexible budget.

UNIT-V

Management control and its characteristics, goals and strategies, structure and control. Responsibility centers and control centers: concepts of Responsibility centers, revenue centers, profit centers and investment centers, transfer pricing, Responsibility reporting.

BOOKS

1. Bhattacharya S.K. and Deardan John “Accounting for Management” PHI
2. Chadwick “The essence of financial accounting” PHI
3. Chadwick “The essence of Management accounting” PHI
4. Grewal “Introduction to Book – keeping”
5. Subhash Sharma “Management control systems” TMH

Note : Paper is to be set unit wise with internal choice.